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(54) RADIO PACKET CHANNEL ALLOCATING METHOD

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an allocating method of a packet channel which more surely, also efficiently, dynamically and also instantly changes line exchange and a slot allocation of a packet in accordance with a occurrence of a call.

SOLUTION: In radio packet communication which is one way duplex system, uses a common channel between a radio base station and plural radio packet terminals and performs radio packet communication, a radio packet terminal which is regarding to newly transmit an up

packet first returns a reserving signal 2-8 in an unused up slot to a radio base station, the radio base station which receives the signal 2-8 secures plural slots over plural frames among unused up frames of frames for related up packet transfer, simultaneously transmits an enabling signal 2-9 including a secured slot number and its frequency in a down slot, and signals an up slot that permits the receiving of the signal 2-8 at the radio packet terminal and use for up packet transfer.

CLAIMS

[Claim(s)]

[Claim 1]performing wireless packet communication using common packet channels between a base transceiver station and two or more radio packet terminals of this base transceiver station

subordinate -- said packet channels -- a slot -- a frame structure which are-izing [a frame structure], summarizes two or more continuous slots, and is made into one frame. Take and further A frame (getting down hereafter frame) from said base station to said radio packet terminal which gets down and transmits a packet, In wireless packet communication which is 1 wave replying method with which multiplex [of the frame (a henceforth, going-up frame) which transmits a going-up packet from said radio packet terminal to said base station] is carried out by time sharing within said frame, Said radio packet terminal which is newly going to transmit an uphill packet, By a going-up slot which is not used, first a reservation signal. Transmit to said base transceiver station and said reservation signal. Said received base transceiver station secures one or more slots to the starting going-up packet transfer over one or more frames out of an intact going-up frame in said frame, and simultaneously a number and frequency of said secured slot. Radio PA getting down from an enabling signal to include, transmitting by a slot, and making a going-up slot to which use is permitted to this radio packet terminal for acceptance of said reservation signal, and this going-up packet transfer know. A blanket channel assignment method.

[Claim 2]performing wireless packet communication using common packet channels between a base transceiver station and two or more radio packet terminals of this base transceiver station subordinate -- said packet channels -- a slot -- a frame structure which are-izing [a frame structure], summarizes two or more continuous slots, and is made into one frame. Take and further A frame (getting down hereafter frame) from said base station to said radio packet terminal which gets down and transmits a packet, In wireless packet communication which is 1 wave replying method with which multiplex [of the frame (a henceforth, going-up frame) which transmits a going-up packet from said radio packet terminal to said base station] is carried out by time sharing within said frame, Said base transceiver station which is newly going to get down and is going to transmit a packet, Choose one or more slots as the starting going-down packet transfer out of an intact going-down frame in said frame, get down from said synchronized signal which gets down and contains a number and frequency of said selected slot in advance of transmission of a packet, and it transmits by a slot, A radio packet channel assignment method which carries out said thing [getting down and making a slot know] which get down and uses it over one or more frames for packet transfer to this radio packet terminal with the feature beforehand.

[Claim 3]performing wireless packet communication using common packet channels between a base transceiver station and two or more radio packet terminals of this base transceiver station

subordinate -- said packet channels -- a slot -- a frame structure which are-izing [a frame structure], summarizes two or more continuous slots, and is made into one frame. Take and further A frame (getting down hereafter frame) from said base station to said radio packet terminal which gets down and transmits a packet, In wireless packet communication which is 1 wave replying method with which multiplex [of the frame (a henceforth, going-up frame) which transmits a going-up packet from said radio packet terminal to said base station] is carried out by time sharing within said frame, Said radio packet terminal which is newly going to transmit an uphill packet, By a going-up slot which is not used, first a reservation signal. Transmit to said base transceiver station and said reservation signal. Said received base transceiver station secures one or more slots to the starting going-up packet transfer over one or more frames out of an intact going-up frame in said frame, and simultaneously a number and frequency of said secured slot. Get down from an enabling signal to include, transmit by a slot, make a going-up slot to which use is permitted to this radio packet terminal for acceptance of said reservation signal, and this going-up packet transfer know, newly get down, and a packet. . I will transmit. Out of an intact going-down frame in said frame, said base transceiver station to carry out chooses one or more slots as the starting going-down packet transfer, and said synchronized signal which gets down and contains a number and frequency of said selected slot in advance of transmission of a packet. A radio packet channel assignment method which gets down, transmits by a slot and carries out said thing [getting down and making a slot know] which get down and uses it over one or more frames for packet transfer to this radio packet terminal with the feature beforehand.

[Claim 4]Claim 1 which gets down from said base transceiver station with a going-up slot which assigns within said frame, and is characterized by going-up slot concerned and the thing [getting down and assigning a slot] concerned according to change of a ratio of a slot, or a radio packet channel assignment method given in 2 or 3.

2.**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the allocation method of the packet channels in TDMA (time division multiple access) wireless packet communication.

[0002]

[Description of the Prior Art]

[conventional technology 1 :P ACS method] Methods of bundling up two or more slots of TDMA and using it as packet channels include a U.S. PACS method. By this method, each slot is shared by the line switching and the packet, and the base station is performing the dynamic allocation of each slot according to traffic. It gets down, the slot has super frame structure, and the super frame header signal which reports a channel configuration a comparatively long cycle is transmitted. Which slot has reported to the radio terminal whether it is assigned for packets using this signal. By receiving this super frame header signal, the terminal which awaits and is in a state can recognize packet channels.

[0003]The signal which a terminal gets down, monitors all slots after shifting to packet channels, and furthermore shows that this slot is a slot for packets (in order to explain simply here) being henceforth synonymous with a Busy/Idle signal -- carrying out -- if contained, the slot concerned will be recognized as a slot for packets, and a packet will be transmitted in a going-up slot corresponding according to directions of a Busy/Idle signal.

[0004]The example of this method of operation is shown in drawing 8. The Busy/Idle signal for random access control (8-5) is given to the going-down slot for packets (8-1). By always

monitoring this control signal, the terminal in a communicating state can recognize the slot for packets which the base station has set up in real time. In drawing 8, 5 of the slots 1, 2, 5, 6, and 7 slots are set up as an object for packets (8-3) among the slots 0-7, and the Busy/Idle signal for random access is given to these slots. The terminal has transmitted the requirement signal by the 6th corresponding slot (8-6-1) of going up after checking the Idle signal of the 6th slot going down. In the base station, transmission of a Busy signal is started from the 6th slot after receiving said requirement signal. The terminal has transmitted the packet by the corresponding following going-up the 6th (8-6-2) and 7 (8-6-3) slot, in response to the fact that the 6th (8-1-1) and 7 (8-1-2) slot changed to Busy. In response to the fact that the base station furthermore reported the Busy signal with the following frame also by the 1st (8-1-3), 2 (8-1-4), and 5 (8-1-5) slot, the terminal is performing packet transfer using 5 of the slots 1, 2, 5, 6, and 7 slots (8-6-4 - 8-6-8). 8-2,8-in figure 4 and 8-6 express the uphill channel, the slot for line switchings, and the going-up sending signal, respectively.

[0005][Conventional technology 2:TDD ALOHA reserving system] As shown in drawing 9, by this method, it goes up, and gets down with the slot for control (9-2), and a frame consists of a slot for control (9-3), and a slot for data transfer (9-4) used for the packet transfer to both directions. Here, 9-5 and 9-6 get down from packet channels, and 9-1 expresses the uphill sending signal, respectively.

[0006]Transmission. First the terminal which it tries to perform by the slot for uphill control A reservation signal. (9-7) is transmitted, and the slot for data transfer is assigned according to the existence of other going-up packets and a going-down packet, and the base station which received this gets down and notifies the quota information on the slot for data transfer (9-8) to each terminal by the slot for control. About going up / distribution from which it gets down, it is controlled dynamically. A terminal performs packet transfer by the slot for data transfer of the following frame based on the notified quota information. By this method, when going up over two or more frames and transmitting data, the terminal needs to transmit a reservation signal for every frame, and needs to receive assignment. It goes up by drawing 9, and gets down with one packet (9-9), and transmission of one packet (9-10) is performed. Already in wireless LAN this method. It is put in practical use (T. Suzuki and.). S. Tasaka, and "Contention-based reservation protocol using a TDD channel for wireless local area networks", Proc.in ICC'93,. 1993 references.

[0007]

[Problem(s) to be Solved by the Invention]When the lost-call rate of a line switching is suppressed when carrying out multiplex [of a line switching and the packet] on one TDMA

channel, and there is no circuit-switched call, in order to assign a slot to a packet and to make high-speed transmission possible, It is necessary to change the slot allocation of a line switching and a packet in an instant dynamically according to generating of a call.

[0008]By the above-mentioned conventional technology 1, the slot for packets is identified to this problem by a terminal's getting down, always monitoring the random access control signal of a slot, and detecting the signal which shows the slot for packets. For this reason, about the slot which each terminal always needed to continue monitoring all the slots irrespective of the line switching/object for packets, got down, and the signal mistook, the judgment of a corresponding going-up slot the object for packets or for line switchings becomes impossible.

[0009]In the system of the dynamic channel assignment which monitors the surrounding situation and chooses the channel used for communication in each wireless zone from the radio frequency which is not used and a slot apart from this problem, shortly after detecting interference, interference. It is necessary to suspend transmission with the received channel and to change to another intact channel. When only some slots have received two or more interference among slots, the method of changing only the frequency of the slot concerned to another frequency is effective, but. Since it does not have a means to report the information which each terminal is monitoring in the conventional technology 1 to get down and concerning frequency at a slot, it is impossible to perform this control.

[0010]By the way, generally go up by packet communication, get down with a packet, and a packet becomes out of balance, Especially, by the file transfer by access and FTP (file transferring program) to a WWW (World Wide Web) server, it will go up, and will usually get down compared with a packet, and the traffic of a packet will be 1000 or more times. For this reason, in order to raise channel efficiency, the method of responding to traffic, going up,/getting down and coming out, and changing radio resources accommodative is dramatically effective. Since it is necessary to go up by the conventional technology 1 and to get down with a slot and the slot always needs to become a pair, such control is impossible. On the other hand in the conventional technology 2, a reservation signal, and going up get down, are performing the dynamic allocation of the slot for data transfer according to the transfer request, and corresponding to change of traffic / dynamic slot allocation from which it gets down is possible for every frame. However, it goes up for every frame and gets down with the slot for control, the slot for control is required, and since random access is also performed per frame, it is a factor which reduces channel efficiency.

[0011]The purpose of this invention is to provide the allocation method of the packet channels

which solved the above point.

[0012]

[Means for Solving the Problem]In order to solve a technical problem described for the foregoing paragraph, within an enabling signal which is gone up by this invention and a base station transmits to a reservation signal from a terminal about a packet (Claims 1 and 3), It is characterized [main] by reporting which (claims 2 and 3) slot is used on which frequency at a packet in a synchronized signal transmitted before it gets down and a base station transmits data about a packet. It is characterized also by holding a slot for packet transfer over a period required for transmission of the packet concerned, and a multiple frame simultaneously. This differs from needing request-to-print-out-files / quota operation for every frame, when transmitting a packet to that a terminal judges a slot for packets based on a Busy/Idle signal with which the conventional technology 1 is reported for every slot, and a frame which the conventional technology 2 follows.

[0013]It is possible for this to perform a change and a notice of a use slot for every packet transmission, and it is also possible for a slot for packets not to become unusable, even when it gets down and a slot is mistaken, and to change frequency of some slots for every packet transmission.

[0014]Since it is possible to get down with a reservation signal which arrived at a base station, to go up according to a packet, to get down with a slot, and to assign a slot dynamically when furthermore premised on TDD (time sharing duplex) (claim 4), It is possible to get down with uphill TORABIKKU, and to raise channel efficiency, even when traffic is out of balance.

[0015]

[Embodiment of the Invention]The system configuration example in this example is shown in drawing 1. As shown here, a system A base transceiver station. (1-1) and the wireless zone which this base transceiver station forms. (1-3) It consists of two or more radio packet terminals (1-2) which exist inside, and packet multiplexing of the packet signal between each radio packet terminal (the following, terminal) and a base transceiver station (the following, base station) is carried out on the packet channels used in common between each terminal.

[0016][Embodiment 1] Embodiment 1 based on claims 1-3 is described. The example 1 of transmission of the going-up packet in this embodiment is shown in drawing 2. As shown in this figure, in this example, a channel is considered as 4 ch TDMA-TDD composition, it gets down, and the slots 0, 1, 2, and 3 (2-1) have become the going-up slots 4, 5, 6, and 7 (2-2) and a pair, respectively. The slots 2, 3, 6, and 7 are used by the line switching here (2-4), and it is usable as

an object for packets in the remaining slots (2-3). The slots 0 and 4 are always set up as a slot for packets, and the frequency is reported to each terminal within the control information reported more nearly periodically than a base transceiver station. Although the terminal which received this control information and shifted to the slot for packets always receives this slot 0, it is also possible to receive slots other than these slots as well as the conventional method, to detect a Busy/Idle signal (2-5), and to recognize the slot for packets beforehand. Drawing 2 shows the case of the latter terminal. The terminal which send data produced has transmitted the reservation signal (2-8) by the slot 5 used as Idle. On the other hand, the base station specifies the slots 4 and 5 and each frequency f0 and f1 to the terminal concerned within an enabling signal (2-9) as a channel for the transmission for uphill packets. The base station is reporting the Busy signal simultaneously by the going-down slots 0 and 1 which correspond so that it may not collide with other going-up signals by the specified slot. The terminal which received this goes up in the specified channel, and is transmitting packet data (2-10). It gets down and the inside 2-6 of a figure and 2-7 express the uphill sending signal, respectively.

[0017]Next, it gets down and the example of transmission of a packet is shown in drawing 3. Although the channel configuration is the same as that of drawing 2, the slots 1 and 5 are used for the circuit-switched call here (3-4), and it is usable in the 0, 2, 3, 4, 6, and 7 as a slot for packets (3-3). [remaining] In the slot 0 into which all the terminals have received the base station which got down and generated the packet in advance of transmission of a packet, **** used as a transmission object was called, the **** synchronized signal (3-7) was transmitted, and the use slots 0, 2, and 3 and the frequency f0 of each slot, f2, and f3 are simultaneously specified in this synchronized signal. It gets down at this time, and even if it is during signal transmission, it goes up, and since reception of a signal is possible, the Busy/Idle signal (3-5) is maintained with Idle. The terminal which received the call with the synchronized signal gets down on the slot and frequency which were specified, and receives data (3-8). In drawing 3, it gets down from the numerals 3-1 and 3-2, respectively, and an uphill channel and 3-6 get down, and express the sending signal.

[0018][Embodiment 2] Embodiment 2 which combined the composition according to claim 4 with Embodiment 1 next is described. The example of uphill packet transfer in Embodiment 2 is shown in drawing 4. Here, the slots 1 and 5 are used as an object for line switchings like drawing 3 (4-4). The terminal which detected the Idle signal of the slot 0 is transmitting the reservation signal (4-8) using the corresponding slot 4. The base station which received this goes up the slots 2, 3, 4, 6, and 7 which get down from it getting down and there being no packet, and include a

part of slot and the frequency f2, f3, f0, f2, and f3, assigns them to packet transfer, and shows these information within the enabling signal (4-9). It has prevented going up simultaneously, and the slot 0 corresponding to the slot 4 reporting a Busy signal, and other terminals going up by the slot 4, and transmitting a signal. The terminal which obtained the enabling signal goes up by the specified channel, and is transmitting data (4-10). With this figure, since it got down with the following frame and the packet arose again, signs that a base station transmits a synchronized signal (4-11) by the usable slot 0, get down from it using the same slot 0, and data (4-12) is transmitted are also shown. In drawing 4, it gets down from the numerals 4-1 and 4-2, respectively, and 4-3 gets down from an uphill channel, 4-5 gets down from the slot for packets, and 4-6 and 4-7 get down from a Busy/Idel signal, respectively, and the uphill sending signal is expressed.

[0019]The example of going-down packet transfer in this embodiment is shown in drawing 5. The base station which got down like drawing 3 and the packet produced has transmitted the synchronized signal (5-8) by the slot 0. Since there is no Request to Send of an uphill packet at this time, the base station got down from the slots 0, 2, 3, 4, 6, and 7 including a part of going-up slot and the frequency f0, f2, f3, f0, f2, and f3, was assigned to packet transfer, and is specified within a synchronized signal (5-8). The target terminal receives the channel specified within the synchronized signal (5-8), and receives the packet data (5-9) from a base station. At this time, the Busy/Idle signal (5-5) of the slots 0, 2, and 3 corresponding to the slots 4, 6, and 7 which get down and are used for packet transfer is set to Busy, and the slots 4, 6, and 7 are not used for going-up access of other terminals, and are making. When it gets down and transmission of a packet is completed, the slots 4-7 are gone up again, and in order to make it usable as a slot, a base station resumes the information of an Idle signal in the slots 0, 2, and 3. The packet data from the terminal which is communicating previously are completed, and the terminal which it got down and the transmitting packet generated during packet transfer transmits a reservation signal (5-10), after waiting for the slot for packets to change to an Idle signal. In drawing 5, it gets down from the numerals 5-1 and 5-2, respectively, and 5-3 gets down from an uphill channel, and 5-6 and 5-7 get down from the slot for packets, respectively, and the uphill sending signal is expressed.

[0020]

[Example]The operation flow of a base transceiver station and a terminal explains the example of this invention. The example of an operation flow of the base transceiver station in this invention is shown in drawing 6. This operation flow consists of the transmitting process (6-6 to

6-16) of operating independently and a receiving process (6-17 to 6-23), and a slot management task (6-24 to 6-26) that performs management and assignment of a slot further besides a main flow (6-1 to 6-5). When it always got down from the base station by the main flow (6-1), and the existence (6-2) of a packet and reception (6-4) of a reservation signal are supervised, it gets down and a packet occurs, a transmitting process is started (6-3), and when a reservation signal is received, a receiving process (6-5) is started.

[0021]In a transmitting process (6-6), when there is an untransmitted packet by the transmitting process started before, waiting (6-7) and when it completes, a slot management task (6-24) is called next, until transmission is completed (6-8). By a slot management task (6-24), the slot allocation situation and the usable frequency of a channel are always monitored, and when this task is called, an usable slot and frequency are assigned according to the algorithm which was able to be decided beforehand at the time (6-25). Subsequently, the transmitting process which received assignment reports a Busy signal by the going-down slots 0-3 corresponding to (6-9) and each going-up slot assigned in the following frame, when it goes up to the assigned slot and the slots 4-7 are included (6-10). Within the same frame as this, a synchronized signal including the slot concerned and information on frequency that got down and assignment was received on the occasion of packet transmission is transmitted (6-11). Transmission of a synchronized signal is always performed by the slot 0 here. Following on a synchronized signal, it gets down by the specified channel, and a packet is transmitted (6-12). After transmission is completed, access of the going-up [in / it gets down, the Busy information (6-10) of the slots 0-3 is called off, and Idle information is performed (6-13), and / the slots 4-7] signal corresponding to the going-up slots 4-7 temporarily used for these going-down packet transfer is enabled. On the other hand, when the going-up slots 4-7 are not used, it gets down and there is no change of the Busy/Idle signal accompanying packet transfer (6-15 to 6-16).

[0022]Next, in a receiving process (6-17), a slot management task (6-24) as well as a transmitting process is called (6-18), an enabling signal including the slot assigned by performing Busy information (6-19) simultaneously by the slots 0-3 corresponding to the going-up slot assigned from the slot management task (6-24) and the information on frequency is transmitted (6-20). Then, the going-up packet from the terminal transmitted via the specified channel is received (6-21), and after a reception end, the slot set as Busy at Step 6-19 is canceled, and it returns to Idle information (6-22).

[0023]The example of an operation flow of the radio packet terminal in this invention is shown in drawing 7. The terminal has always received the slot 0 (7-2), and when the synchronized signal

addressed to a carrier office is transmitted from a base station here (7-3), it receives a packet by the channel specified within this synchronized signal (7-4). On the other hand, when a transmitting packet occurs, a reservation signal is transmitted in (7-5) and the going-up slot which corresponds when it gets down, the Busy/Idle signal of a slot is received and an Idle signal is detected (7-6) (7-7). When detecting an Idle signal here, the Idle signal reported by slots 1-3 other than slot 0 may be received. After reservation signal transmission, when the enabling signal was receivable (7-8) and transmission (7-9) and an enabling signal are not received for a packet on the slot and frequency which are specified within the enabling signal, a reservation signal is resent.

[0024]

[Effect of the Invention]In the radio packet channel assignment method by this invention, each terminal should monitor only one slot to reservation signal transmission, and even if it gets down and a slot mistakes after the completion of a request to print out files, it can transmit a packet using the slot for packets specified with the enabling signal, and its frequency. Even when changing the frequency of some slots by interference etc., it becomes possible by specifying new frequency within an enabling signal and a synchronized signal to change the frequency of a slot in an instant dynamically for every transmission of a packet. even if it furthermore uses two or more slots -- the upper and lower sides -- since assignment out of balance is attained and a resource can be secured over a multiple frame, channel efficiency and the characteristic of random access improve.

2.**** shows the word which can not be translated.

3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]The system configuration example in this example is shown.

[Drawing 2]The example of uphill packet transfer by Embodiment 1 is shown.

[Drawing 3]The example of going-down packet transfer by Embodiment 1 is shown.

[Drawing 4]The example of uphill packet transfer by Embodiment 2 is shown.

[Drawing 5]The example of going-down packet transfer by Embodiment 2 is shown.

[Drawing 6]The example of an operation flow of the base transceiver station in this invention is shown.

[Drawing 7]The example of an operation flow of the radio packet terminal in this invention is shown.

[Drawing 8]The example of a PACS method of operation is shown.

[Drawing 9]The example of a TDD ALOHA reserving system of operation is shown.

[Description of Notations]

1-1 Base transceiver station

1-2 Radio packet terminal

1-3 The wireless zone which the base transceiver station of the base transceiver station 1-1 forms

2-1,3-1 and 4-1,5-1 -- getting down 8-1 -- a channel

2-2,3-2, 4-2,5-2, and 8-2 Uphill channel

2-3,3-3, 4-3,5-3, and 8-3 Slot for packets

2-4,3-4, 4-4,5-4, and 8-4 Slot for line switchings

2-5,3-5, 4-5,5-5, an 8-5 Busy/Idle signal

2-6,3-6 and 4-6,5-6 -- getting down 9-5 -- a sending signal

2-7,4-7, 5-7,8-6, and 9-6 Uphill sending signal

2-8,4-8 and 5-10,9-7 Reservation signal

2-9,4-9 and 5-11 Enabling signal

2-10,4-10 and 9-9 Uphill packet data

3-7,4-11 and 5-8 Synchronized signal

3-8,4-12 -- getting down 5-9,9-10 -- packet data

6-1-6-5 Example of flows of control of a radio group reason office (main flow)

6-6-6-16 Example of flows of control of a base transceiver station (transmitting process)

6-17-6-23 Example of flows of control of a base transceiver station (receiving process)

example of flows of control of 6-24-6-26 base transceiver station (slot management task)

The example of an operation flow of 7-1 - a 7-9 radio-packet terminal

9-1 Up-and-down packet channels

9-2 The slot for uphill control

9-3 Get down and it is a slot for control.

9-4 The slot for data transfer

9-8 Slot allocation information